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Diploma
Examinations
Program

Mathematics and Sciences Bulletin
1989 - 90 School Year

Students
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Student Evaluation
and Records

Alberta
EDUCATION

August 1989

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MATHEMATICS AND SCIENCES
DIPLOMA EXAMINATION UPDATE
for 1990

The following information provides an update for teachers and students of Mathematics 30, Biology 30, Chemistry 30, and Physics 30 regarding:

- Grade 12 Diploma Examinations Schedule 1990;
- Marking Information, 1990;
- General Information; and
- Subject Specific Information in Mathematics and the Sciences.

GRADE 12 DIPLOMA EXAMINATIONS SCHEDULE 1990

Dates for the administration of the Mathematics and Sciences diploma examinations in 1990 are as follows:

DATE	SUBJECT	TIME
January 26, 1990:	Chemistry 30	1:00 - 3:30 p.m.
January 29, 1990:	Physics 30	1:00 - 3:30 p.m.
January 30, 1990:	Mathematics 30	9:00 -11:30 a.m.
	Biology 30	1:00 - 3:30 p.m.
June 22, 1990:	Chemistry 30	1:00 - 3:30 p.m.
June 25, 1990:	Physics 30	1:00 - 3:30 p.m.
June 26, 1990:	Mathematics 30	9:00 -11:30 a.m.
June 27, 1990:	Biology 30	9:00 -11:30 a.m.
August 14, 1990:	Chemistry 30	1:00 - 3:30 p.m.
August 15, 1990:	Biology 30	9:00 -11:30 a.m.
	Mathematics 30	1:00 - 3:30 p.m.
August 16, 1990:	Physics 30	9:00 -11:30 a.m.

MARKING INFORMATION, 1990

The written-response portion of the mathematics and science diploma examinations is marked by classroom teachers.

To qualify as a marker, teachers must:

- be recommended by their superintendent;
- have taught the subject for two or more years;
- be currently teaching the subject; and
- have an Alberta Permanent Professional Certificate.

We have a particular need for teachers who can mark examinations written in French.

Teachers who wish to be recommended as markers for the *January 1990* examination should contact their superintendents before *September 23, 1989*.

Teachers who wish to be recommended as markers for the *June* and *August 1990* examinations should contact their superintendents before *March 17, 1990*.

MARKING DATES

	January 1990 Administration	June 1990 Administration	August 1990 Administration
Biology 30	February 7-10	July 9-13	August 17-18
Chemistry 30	February 7-10	July 9-13	August 17-18
Mathematics 30	February 7-10	July 9-13	August 17-18
Physics 30	February 7-10	July 9-13	August 17-18

GENERAL INFORMATION

FORMAT

The time alloted for the diploma examinations in the mathematics and science subjects is two and one-half (2.5) hours. The examinations consist of machine-scorable questions and written-response questions.

The machine-scorable questions include multiple-choice and, for Chemistry 30 and Mathematics 30, open-ended questions.

Please refer to the Chemistry and Mathematics sections of this bulletin for further details regarding machine-scorable open-ended questions.

NOTE: Questions that require the synthesis of concepts from more than one unit may be asked on mathematics and science diploma examinations.

CALCULATORS

On a Diploma Examination students may *not* use any calculators unless the memories have been cleared prior to the examination.

They may *not* use calculators with the ability to display the graph of a mathematical function.

They may *not* use external or peripheral attachments to their calculators.

NOTE: Presiding examiners are *required* to inspect all calculators brought into an examination room to ensure that the above regulations have been adhered to.

For the complete policy statement see Appendix C, page 32 of this bulletin.

If a student, or teacher, is in doubt about allowing a specific calculator to be used, please at some point prior to the day of the examination call the Associate Director of the Mathematics/Sciences Unit at 427-2948 in Edmonton.

SECURITY

No materials can be taken into the examination room or removed from the examination room except pens, pencils, erasers, rulers, protractors, and calculators.

Students may write in the examination booklet, but they should not normally be given additional paper.

Calculator memories must be cleared prior to entering the examination room.

MACHINE-SCORABLE OPEN-ENDED QUESTIONS

You have no doubt noticed that the 1989 Mathematics 30 diploma examinations introduced a new machine-scorable section that has open-ended questions.

The 1990 Chemistry 30 diploma examinations will also include machine-scorable open-ended questions. The Chemistry section of this bulletin will provide you with more details.

All the field tests for the 1990 school year for Physics 30 will use machine-scorable open-ended questions. The Physics 30 section of this bulletin will provide you with more details.

PERFORMANCE STANDARDS

Each of the subject discipline sections in this bulletin has a new section that describes the students for whom the courses are intended and that includes a standards statement on the level of performance required of a borderline student and of an honors student.

Standards in education are statements that clearly and concisely communicate the level of achievement necessary to attain a specific goal or objective. Standards are set to help define goals and objectives. They assist educators in determining the extent to which the goals or objectives must be achieved in order to be considered successful or the extent to which students must know the content and have the skills required to pass the course.

We would appreciate any feedback that you have on these "draft" statements of performance standards. Please address your concerns, deletions and/or additions to:

Associate Director
Mathematics/Sciences Unit
Student Evaluation and Records Branch
Alberta Education
Box 43, 11160 Jasper Avenue
EDMONTON, Alberta
T5K 0L2 FAX: 422-4200

TARGET GROUP -- FOR WHOM IS THE COURSE INTENDED?

Currently, the Mathematics 30 population comprises essentially all students who have passed Mathematics 20 and an increasingly large number of students from Mathematics 33 who wish to improve their mathematics credentials. This combination has resulted in an increased proportion of Grade 12 students enrolling in Mathematics 30 each year.

Those students for whom the course is intended comprise the target group. The learner expectations for Mathematics 30 are appropriate for the upper half of the provincial Grade 12 population; the target group for Mathematics 30 is therefore those students in the upper half of the Grade 12 population. It is, however, appropriate to encourage 55% to 60% of Grade 12 students to attempt the course.

The standards for the 1990 Mathematics 30 diploma examinations are being set on the target group and not on the population that attempts the course. Consequently, when examining the pass rate, the percentage of students receiving an A standing, the test mean, etc., it is important to ascribe these statistics to the target group and not to the total Mathematics 30 population.

PERFORMANCE STANDARDS

Students who attain an *acceptable* level of performance in Mathematics 30 receive a final passing mark near 50%. They have gained new skills and knowledge in mathematics but can anticipate severe difficulties if they choose to enrol in post secondary mathematics courses.

These students have demonstrated mathematical skills and knowledge in all of the six content strands of the Mathematics 30 curriculum. Such students can do most open-ended questions operating at the Knowledge or Comprehension cognitive levels. They are successful at some Application level questions but usually have difficulty with questions operating at the Higher Mental Activities level. For example, these students would be able to solve a trigonometric equation that involves factoring but would likely encounter difficulties if they first had to make a substitution. In Quadratic Relations, they would be able to determine the length of the minor axis and the foci of a given ellipse, but they would have some trouble finding the equation of an ellipse given its foci and the length of the minor axis.

Students who attain an *exceptional* level of performance in Mathematics 30 receive a final mark of 80% or better. Such students have demonstrated their ability and interest in mathematics and feel confident about their mathematical abilities. These students should encounter little difficulty in post-secondary mathematics programs and should be encouraged to pursue careers that will utilize their talent in mathematics.

Exceptional students demonstrate a thorough knowledge of mathematics and the skills necessary to apply this knowledge to new situations. These students can answer most open-ended questions at all four cognitive levels. They can determine the value of the third term of an arithmetic series given a formula for the sum of n terms. They can also find the equation of a polynomial function given the x-intercepts and the co-ordinates of a point on the graph other than the y-intercept. Exceptional students are equally adept at solving similar questions in the other four content strands.

STRUCTURE OF THE EXAMINATION

Each Mathematics 30 diploma examination is designed to reflect the Mathematics 30 core concepts that are outlined in the *Program of Studies for Senior High Schools.*

The concepts on the 1990 Mathematics 30 diploma examinations are emphasized as follows:

Concept[1]	Emphasis in Per Cent of the Total Examination Mark
Trigonometry	25
Quadratic Relations	22
Sequences, Series, and Limits	20*
Statistics	13*
Logarithms	9
Polynomial Functions	11*
	100%

The cognitive levels on the 1990 Mathematics 30 diploma examinations are emphasized as follows:

Cognitive Level[2]	Emphasis in Per Cent of the Total Examination Mark
Knowledge	9*
Comprehension	31*
Application	46*
Higher Mental Activities	14*
	100%

Each examination is built as closely as possible to the above specifications. However, small adjustments are sometimes necessitated as a result of including four or five-mark written-response questions. The concept areas are distributed proportionately over the cognitive levels and vice versa.

The design of the 1990 Mathematics 30 diploma examinations is as follows:

Question Format	Number of Questions	Number of Marks	% Emphasis
Multiple-Choice	40	40	61.5*
Machine-Scorable Open-Ended	12	12	18.5*
Written-Response	3	13	20.0

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[1] Concept descriptions have been shortened in this table.

[2] An explanation of cognitive levels is given in Appendix B.

*These changes in emphasis are outlined on the following pages.

CHANGES FOR THE 1990 MATHEMATICS 30 DIPLOMA EXAMINATIONS

There will be three changes implemented on the 1990 Mathematics 30 diploma examinations:

- The number of machine-scorable multiple-choice questions in Part A of the examination will be reduced from 45 to 40. The number of machine-scorable open-ended questions in Part B will be increased from 7 to 12. (A model of the new answer sheet follows on page 9.)

- The percentages of each examination devoted to the concept strands will be revised to put less emphasis on Statistics.

This modification will reduce the need to have duplicate or similar questions appear on the same examination.

- The revised examination structure will put more emphasis on the Application and Higher Mental Activities cognitive levels.

The shift in the emphasis of the cognitive levels on the 1990 diploma examinations will enable educators to differentiate more effectively between students who are strong in mathematics and those who are clearly outstanding. This modification to the structure of the examination may affect the provincial mean and the percentage of students who receive an A standing.

It should be noted, however, that the examinations will continue to contain the same number of questions that students find "easy" or "moderately easy". The chances of success for students who find mathematics difficult should be the same as in previous years.

COGNITIVE LEVELS

When teaching or testing any concept or skill, it is possible to function at any of the four cognitive levels (Knowledge, Comprehension, Application, and Higher Mental Activities). The sample questions that follow illustrate these cognitive levels. All the examples require some knowledge of the definition of a conic section; however, the questions function at different cognitive levels.

EXAMPLE #1 COGNITIVE LEVEL -- KNOWLEDGE
SOURCE: JUNE 1989 DIPLOMA EXAMINATION, QUESTION 22

The locus of a set of points in a plane that are equidistant from a fixed point is

*A. a circle
B. an ellipse
C. a parabola
D. a hyperbola

EXAMPLE #2 COGNITIVE LEVEL -- COMPREHENSION
SOURCE: JANUARY 1989 FORM B DIPLOMA EXAMINATION, QUESTION 13

From a point on the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$, the sum of the distances to the foci is

A. 6
*B. 8
C. 9
D. 16

EXAMPLE #3 COGNITIVE LEVEL -- APPLICATION
SOURCE: RAW ITEM

If $P(4, 2.5)$ is on an ellipse with foci at $(\pm 3, 0)$ then the length of the major axis of this ellipse correct to the nearest tenth will be

A. 8.5
B. 8.8
C. 9.4
*D. 10.1

EXAMPLE #4 COGNITIVE LEVEL -- HIGHER MENTAL ACTIVITIES
SOURCE: JANUARY 1989 DIPLOMA EXAMINATION, QUESTION 16

A parabola with axis of symmetry $y = -3$ and directrix $x = -2$ passes through the point (4, 3). The equation of the parabola is

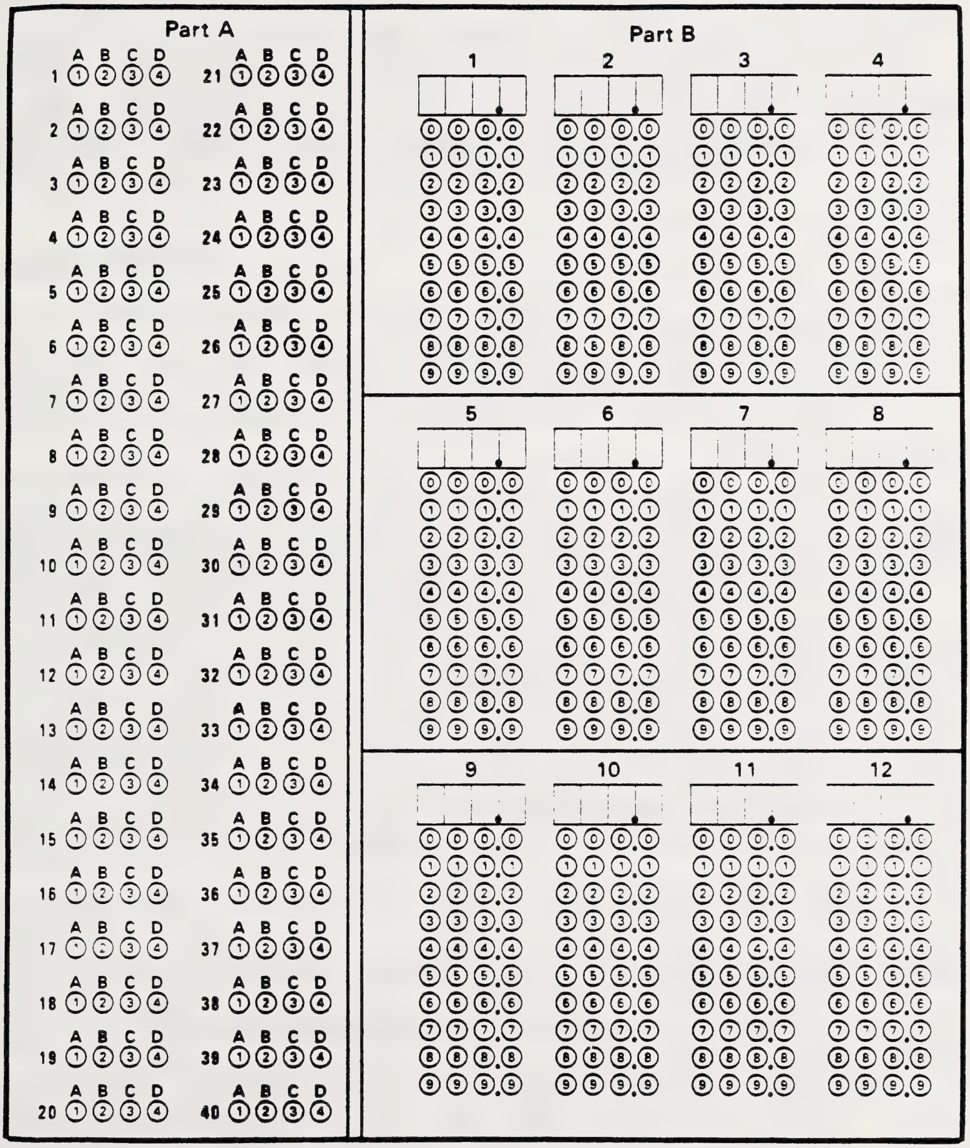
A. $y^2 - 16x + 6y + 37 = 0$

*B. $y^2 - 12x + 6y + 21 = 0$

C. $y^2 - 4x + 12y - 29 = 0$

D. $y^2 + 4x - 12y + 11 = 0$

MODEL OF THE ANSWER SHEET



Part A

	A	B	C	D		A	B	C	D
1	①	②	③	④	21	①	②	③	④
2	①	②	③	④	22	①	②	③	④
3	①	②	③	④	23	①	②	③	④
4	①	②	③	④	24	①	②	③	④
5	①	②	③	④	25	①	②	③	④
6	①	②	③	④	26	①	②	③	④
7	①	②	③	④	27	①	②	③	④
8	①	②	③	④	28	①	②	③	④
9	①	②	③	④	29	①	②	③	④
10	①	②	③	④	30	①	②	③	④
11	①	②	③	④	31	①	②	③	④
12	①	②	③	④	32	①	②	③	④
13	①	②	③	④	33	①	②	③	④
14	①	②	③	④	34	①	②	③	④
15	①	②	③	④	35	①	②	③	④
16	①	②	③	④	36	①	②	③	④
17	①	②	③	④	37	①	②	③	④
18	①	②	③	④	38	①	②	③	④
19	①	②	③	④	39	①	②	③	④
20	①	②	③	④	40	①	②	③	④

Part B

1	2	3	4
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9	10	11	12
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There are some words and phrases often used in mathematics classrooms that are not well defined in a mathematical context. Examples include the words *rises*, *falls*, *upward*, or *downward* and the phrases *to the left* or *to the right*. The examples that follow illustrate how these words and phrases may be used on future diploma examinations.

EXAMPLE #1 The graph of a polynomial function falls to the right for large values of x and has x-intercepts of -3, 0, and 5. An equation for the polynomial function could be

*A. $y = x(x + 3)(5 - x)$

B. $y = x(x + 3)(x - 5)$

C. $y = x(3 - x)(x + 5)$

D. $y = x(x - 3)(x + 5)$

EXAMPLE #2 The vertex of a parabola is at $(2, -3)$. If the focus is four units from the vertex and the parabola opens downward, then an equation of the parabola will be

A. $(y + 3)^2 = -16(x - 2)$

B. $(y + 3)^2 = 16(x - 2)$

C. $(x - 2)^2 = 16(y + 3)$

*D. $(x - 2)^2 = -16(y + 3)$

EXAMPLE #3 If the graph of $y = \sin \theta$ undergoes a phase shift of $\frac{\pi}{2}$ to the right, the result is the graph of

A. $y = \cos \theta$

*B. $y = -\cos \theta$

C. $y = \cos\left(\theta + \frac{\pi}{2}\right)$

D. $y = -\cos\left(\theta + \frac{\pi}{2}\right)$

TARGET GROUP -- FOR WHOM IS THE COURSE INTENDED?

The Biology 30 population comprises essentially all students who have passed Biology 20. Those students for whom the course is intended comprise the target group. The learner expectations for Biology 30 are appropriate for the upper 60% of the provincial Grade 12 population. It is appropriate, however, to encourage up to 65% of Grade 12 students to attempt the course. This percentage is consistent with the present enrolment ratios.

PERFORMANCE STANDARDS

Students of Biology 30 have developed their aptitude for observing, collecting facts, forming generalizations, hypothesizing, and making inferences from observations. They have shown growth in their understanding of biological concepts by their increased ability to apply these concepts to relevant situations and to communicate in the specialized language of biology.

Students who attain an *acceptable* level of performance in Biology 30 receive a final passing mark near 50%. They can demonstrate a basic understanding of the nature of scientific investigation by designing and interpreting simple laboratory tests. They can readily interpret data that are presented in simple graphs and tables and can translate into word descriptions symbolic representations of biological functions. They recognize readily and can provide definitions for key biological terms. They can demonstrate an acceptable level of understanding of biological concepts by tracing pathways that materials follow as they are transported through human organ systems, by sequentially ordering the major steps of a physiological process, and by formulating simple structural and functional comparisons between components of human organ systems. The students are able to relate human physiological concepts to common everyday experiences but may have difficulty relating these concepts to health problems. These students compose clear, logical descriptive or explanatory statements about major human physiological concepts.

Students who attain an *exceptional* level of performance in Biology 30 receive a final mark of 80% or better. In addition to meeting the expectations for an acceptable level of performance, they have demonstrated their ability and interest in biology and feel confident about these abilities. They can readily interpret interrelated sets of data such as complex graphs and tables. When presenting scientific data, they select the most appropriate form. Experimental designs can be analysed and evaluated by these students. They can easily identify significant parts of human organs and describe their functions clearly and accurately. They are able to analyse human physiological problems that have at least three interrelated steps, including one step that would not be part of the "known" Biology 30 content. These problems would most likely involve regulatory feedback loops and/or a minimum of two interacting human organ systems. Exceptional students can communicate clearly and concisely, using appropriate scientific vocabulary. Multi-paragraph compositions are within their grasp.

STRUCTURE OF THE EXAMINATION

Each Biology 30 diploma examination is designed to reflect the Biology 30 core concepts that are outlined in the *Program of Studies for Senior High Schools*.

The concepts on the Biology 30 diploma examinations are emphasized as follows:

Concept[1]	Emphasis in Per Cent of the Total Examination Mark
Cellular Processes	9
Homeostatic Mechanisms	4
Nutrition and Digestion	16
Body Fluids	15
Gas Exchange and Transport	7
Energy Release	5
The Kidney	10
Regulation of the Internal Environment	20
Voluntary Movement and Body Support	4
Human Reproduction	10
	100%

The cognitive levels on the Biology 30 diploma examinations are emphasized as follows:

Cognitive Level[2]	Emphasis in Per Cent of the Total Examination Mark
Knowledge	25
Comprehension and Application	55
Higher Mental Activities	20
	100%

Each examination is built as closely as possible to the above specifications. However, some small adjustments are necessitated by the inclusion of questions that draw upon more than one concept or that are five or six marks in value. Also, the concept areas are distributed proportionately over the cognitive levels and vice versa. Questions that require knowledge and skill in the application of scientific processes are distributed throughout the examination but are not associated with specific topics or cognitive levels.

The design of the Biology 30 diploma examinations is as follows:

Question Format	Number of Questions	Number of Marks	% Emphasis
Multiple-Choice	70	70	70
Written-Response	6 or 7	30	30

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[1] Concept descriptions have been shortened in this table.

[2] An explanation of cognitive levels is given in Appendix B.

EMPHASES FOR THE 1990 DIPLOMA EXAMINATIONS IN BIOLOGY

- Questions may include contextual material that goes beyond the core concepts as defined by the curriculum guide. This is considered not only appropriate but necessary if the evaluation of higher cognitive skills is to be achieved, i.e. application, analysis, evaluation. It should *not* be assumed that the examination has thereby redefined the core curriculum for instructional purposes.

- Committees of teachers have been encouraged to develop questions that cross concept boundaries as well as relate biological concepts to actual human experiences. Written-response questions in particular can be used to meet these objectives. The examination blueprint, which depicts the distribution of marks among the core concepts, *must* be interpreted with this in mind.

- The 30 marks allotted to the written-response section of the 1990 Biology 30 examinations will be divided among six or seven questions. For each question, a carefully expressed answer will be required.

CHANGES FOR THE 1990 BIOLOGY 30 DIPLOMA EXAMINATIONS

There will be one change implemented on the 1990 Biology 30 diploma examinations:

- One of the questions will have several marks allotted for course content as well as two marks for written communication skills. These two marks for written communication will be awarded according to a scale specifically prepared for the question. The marking of field tests has shown that students can obtain marks for content alone, partial marks for both content and written communication skills, or full marks for either content or written communication skills. However, it is unlikely that a student would receive marks for written communication skills if marks were not obtained for content. An example follows on pages 14 and 15.

SAMPLE QUESTION THAT INCLUDES THE EVALUATION OF WRITTEN COMMUNCIATION SKILLS

A Modification of Question 4 of the June 1989 Biology 30 Diploma Examination

Use the following table to answer question 4.

The data presented below were recorded during two separate medical examinations of a patient. Following completion of the October 20 examination, the patient was described as healthy. However, following the November 17 examination, the patient was diagnosed as suffering from a bacterial infection of the lungs.

Medical Laboratory Measurements

Examination Date	Cardiac Output (L/min)	Hemoglobin Content of Blood (g/100 mL of blood)	White Blood Cell Count (per mm^3)	O_2 Content of Arterial Blood (mL/100 mL of blood)	O_2 Content of Venous Blood (mL/100 mL of blood)
Oct. 20	5.3	16	8 000	19.5	15.5
Nov. 17	7.3	16	10 000	16.0	13.0

(6 marks) 4. Using complete sentences, explain how each of the symptoms indicated by the November 17 results would relate to a bacterial infection of the lungs. (Marks will be alloted for both content and quality of expression.)

SUGGESTED MARKING KEY FOR CONTENT (Maximum 4 marks)

1 mark - Increased cardiac output functions to compensate for reduced oxygen content of blood.

1 mark - Increased number of white blood cells functions to combat bacterial infection.

1 mark - Decreased oxygen content of arterial blood is caused by fluid buildup in the lungs (reduced surface area), which interferes with oxygen movement into the blood.

OR

- Decreased oxygen content of arterial blood is caused by bacterial interference of oxygen movement into the blood of the lung capillaries.

1 mark - Decreased oxygen content of venous blood is due to decreased levels of oxygen in the arterial blood (the body's demand for oxygen remains relatively constant).

OR

- Decreased oxygen content of venous blood is due to increased oxygen use because of an increased rate of metabolism.

SUGGESTED MARKING SCALE FOR WRITTEN COMMUNICATION SKILLS (Maximum of 2 marks)

2 - The changes in heart function and blood composition are logically related to a bacterial infection of the lungs. The factual content as well as the usage of scientific vocabulary in the explanation reveal a mature understanding of the biological concepts. Incomplete sentences will preclude the student from receiving two marks.

1 - The changes in heart function and blood composition are logically related to a bacterial infection of the lungs, but the explanation may contain some factual errors and/or vague descriptions. The lack of appropriate vocabulary or inconsistent factual information indicates a restricted understanding of the biological concepts.

0 - The changes in heart function and blood composition as represented by the data are not logically related to a bacterial infection of the lungs.

SAMPLE ANSWER TO QUESTION 4

> The results of Nov. 17 tests as compared to that of Oct. 20 shows that the patient has a bacterial infection of the lungs. This is shown by the increase in number of white blood cells which fight the infection by attacking the bacteria. Due to the increased number of WBC, the O_2 content in the blood goes down, which is shown by the drop in O_2 content in the arterial and venous blood. To compensate for the drop in O_2 in the blood the cardiac output will increase.

Evaluation of the sample answer:

Content

Two marks should be given for relating the change in cardiac output to a decrease in blood oxygen levels and relating the increase in white blood cells to fighting the bacterial infection.

Written Communication Skills

One mark should be given for evidence of logical thought clearly expressed. However, the answer contains the false assumption that if white cells increase, the red cell count (oxygen-carrying capacity) decreases. The stable hemoglobin content was ignored.

NEW DIRECTIONS FOR 1990 FIELD TESTS IN BIOLOGY

Some of the field tests administered during January and June of 1990 may include new question formats as listed below.

1. Machine-Scored Questions

    - Multiple-choice questions that each contain a varied number of keyed alternatives

    - Open-ended matching questions

    - Open-ended sequence questions

2. Written-Response Questions

    To evaluate scientific process skills, a set of questions that are based on an actual scientific research paper will be presented. The context for the questions will consist of a synopsis of the report that will include the problem, procedures, as well as tables and/or graphs of data. The questions will require the student to use analytical, interpretative, and evaluative skills.

If the new question formats perform well on the field tests, the *1991* diploma examinations *may* include questions of these types.

TARGET GROUP -- FOR WHOM IS THE COURSE INTENDED?

The Chemistry 30 population comprises essentially all students who have passed Chemistry 20.

Those students for whom the course is intended comprise the target group. The learner expectations for Chemistry 30 are appropriate for 45% of the provincial Grade 12 population. It is, however, appropriate to encourage 50% to 55% of Grade 12 students to attempt the course. This percentage is consistent with the present enrolment ratios.

PERFORMANCE STANDARDS

Students who attain an *acceptable* level of performance in Chemistry 30 receive a final passing mark near 50%. They have gained new knowledge and abilities in chemistry but can anticipate severe difficulties if they choose to enrol in post secondary chemistry courses.

Such students can state and solve numerous problems of the type that require only a one-step solution. For example, they can derive a pH value from a given hydronium ion concentration or find the net voltage for a redox reaction by making use of the data booklet. They are capable of balancing an equation (combustion, formation, neutralization, or redox) and of solving the standard stoichiometric problems based on these equations. Following directions given in laboratory procedures does not present a problem for these students, nor does drawing a graph from experimental data or deriving valid inferences from the graph.

Students who attain an *exceptional* level of performance in Chemistry 30 receive a final mark of 80% or better. They should be well enough prepared to undertake the next level of chemistry with success, whether it be at a university, a technical school, or a nursing school. These students can create their own laboratory procedures given a clear definition of a problem. They can recognize weaknesses in laboratory work and can find appropriate ways of correcting these weaknesses. These students can write their own equations for formation, combustion, neutralization, and redox reactions, and can solve many variations of stoichiometric problems based on these equations. They have the ability to transfer what they see happening in a test tube into equation form and can express scientific ideas clearly. The most significant characteristic of this group is that they can solve problems of a new and novel nature and can extrapolate these solutions to higher levels of understanding. They usually possess good communication skills and can extract vital information from laboratory data or from word problems.

STRUCTURE OF THE EXAMINATION

Each Chemistry 30 diploma examination is designed to reflect the Chemistry 30 core concepts that are outlined in the *Program of Studies for Senior High Schools*.

The concepts on the 1990 Chemistry 30 diploma examinations are emphasized as follows:

Concept[1]	Emphasis in Per Cent of the Total Examination Mark
Chemical Energetics	32
Acids and Bases	34
Oxidation Reduction	34
	100%

The cognitive levels on the 1990 Chemistry 30 diploma examinations are emphasized as follows:

Cognitive Level[2]	Emphasis in Per Cent of the Total Examination Mark
Knowledge	30*
Comprehension and Application	50
Higher Mental Activities	20*
	100%

Each examination is built as closely as possible to the above specifications. However, small adjustments are sometimes necessitated by the inclusion of four and five-mark written-response questions and questions that include more than one concept area. The concept areas are distributed proportionately over the cognitive levels and vice versa. Questions requiring knowledge and skill in the application of scientific processes are distributed throughout the examination but are not associated with specific topics or cognitive levels.

The design of the 1990 Chemistry 30 diploma examinations is as follows:

Question Format	Number of Questions	Number of Marks	% Emphasis
Multiple-Choice	49	49	70*
Machine-Scorable Open-Ended	7	7	10*
Written-Response	3	14	20

---

[1] Concept descriptions have been shortened in this table.

[2] An explanation of cognitive levels is given in Appendix B.

*These changes in emphasis are outlined on the following pages.

EMPHASES FOR THE 1990 DIPLOMA EXAMINATIONS IN CHEMISTRY

- Individual questions on all three sections of the examination may include concepts from more than one unit.
- Written-response questions will include a written component that requires students to see relationships among concepts learned.
- Written-response questions may require the writing of balanced chemical reaction equations with correct states of matter.
- Numerical answers are only to be rounded once, at the end of the question. Intermediate answers are used as displayed on the calculator.

CHANGES FOR THE 1990 DIPLOMA EXAMINATION IN CHEMISTRY

There will be two changes implemented on the 1990 Chemistry 30 diploma examinations:

- The knowledge component of the examination will decrease by 5% and the higher mental activites component will increase by 5%.
- The machine-scorable open-ended questions are similar to those used in the 1989 Mathematics 30 examinations. However, students will fill in only *three* of the four boxes for calculation questions. The decimal point is between the second and third column. An example of the instruction page follows on page 20. A model of the answer sheet follows on page 21. Sample machine-scorable open-ended questions follow on pages 22 to 24.

The shift in the emphasis of the cognitive levels on the 1990 diploma examinations will enable educators to differentiate more effectively between students who are strong in chemistry and those who are clearly outstanding. This modification to the structure of the examination may affect the provincial mean and the percentage of students who receive an A standing.

It should be noted, however, that the examinations will continue to contain the same number of questions that students find "easy" or "moderately easy". The chances of success for students who find chemistry difficult should be the same as in previous years.

SAMPLE INSTRUCTION SHEET (FOR MACHINE-SCORABLE OPEN-ENDED QUESTIONS)

INSTRUCTIONS

In this section of the examination, there are seven machine-scorable open-ended questions each with a value of one mark. All numbers used in the questions are to be considered as the result of a measurement.

Read each question carefully.

Solve each question and write your answer on the separate answer sheet.

Record your answer to *three* digits for *all* questions involving calculations, then fill in the circles that match your answer.

Use an HB pencil only.

If you wish to change an answer, erase your first answer completely.

Example of a *correct-order* question. All *four* boxes are filled in with the decimal point ignored.

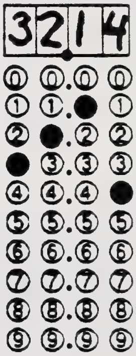
1. When the following subjects are arranged in alphabetic order, the order will be _________.

   1. Mathematics
   2. Chemistry
   3. Biology
   4. Physics

   Answer: 3,2,1,4

   Record 32.14

ANSWER SHEET



Example of a *calculation* question. Only *three* of the four boxes are used with the decimal point on the answer sheet determining which three boxes to use.

2. The mass in grams of silver metal formed when 0.220 mol of silver nitrate solution reacts with excess copper metal, to three digits, is __________g.

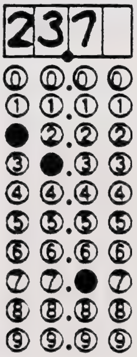
   $\text{mass}_{Ag} = (0.220\ \text{mol})(107.87\ \text{g/mol})$

   $= 23.7314\ \text{g}$

   $= 23.7\ \text{g}$

   Record 23.7

ANSWER SHEET



MODEL OF THE ANSWER SHEET

Part A

	A	B	C	D
1	①	②	③	④
2	①	②	③	④
3	①	②	③	④
4	①	②	③	④
5	①	②	③	④
6	①	②	③	④
7	①	②	③	④
8	①	②	③	④
9	①	②	③	④
10	①	②	③	④
11	①	②	③	④
12	①	②	③	④
13	①	②	③	④
14	①	②	③	④
15	①	②	③	④
16	①	②	③	④
17	①	②	③	④
18	①	②	③	④
19	①	②	③	④
20	①	②	③	④
21	①	②	③	④
22	①	②	③	④
23	①	②	③	④
24	①	②	③	④
25	①	②	③	④
26	①	②	③	④
27	①	②	③	④
28	①	②	③	④
29	①	②	③	④
30	①	②	③	④
31	①	②	③	④
32	①	②	③	④
33	①	②	③	④
34	①	②	③	④
35	①	②	③	④
36	①	②	③	④
37	①	②	③	④
38	①	②	③	④
39	①	②	③	④
40	①	②	③	④
41	①	②	③	④
42	①	②	③	④
43	①	②	③	④
44	①	②	③	④
45	①	②	③	④
46	①	②	③	④
47	①	②	③	④
48	①	②	③	④
49	①	②	③	④

Part B

1

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

2

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

3

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

4

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

5

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

6

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

7

⓪	⓪.	⓪	⓪
①	①.	①	①
②	②.	②	②
③	③.	③	③
④	④.	④	④
⑤	⑤.	⑤	⑤
⑥	⑥.	⑥	⑥
⑦	⑦.	⑦	⑦
⑧	⑧.	⑧	⑧
⑨	⑨.	⑨	⑨

SAMPLE MACHINE-SCORABLE OPEN-ENDED QUESTIONS

1. The volume, in millilitres, of 0.100 mol/L $H_2SO_4(aq)$ required to neutralize 80.0 mL of 0.100 mol/L NaOH(aq), to three digits, is ____________mL.

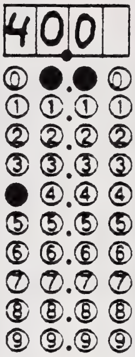
$$\begin{aligned} \text{moles } H_2SO_4 &= \tfrac{1}{2}(\text{moles NaOH}) \\ &= \tfrac{1}{2}(0.0800\ \text{L})(0.100\ \text{mol/L}) \\ &= 0.00400\ \text{mol} \end{aligned}$$

$$\begin{aligned} \therefore \text{volume } H_2SO_4 &= 0.00400\ \text{mol}/(0.100\ \text{mol/L}) \\ &= 40.0\ \text{mL (three-digit answer)} \end{aligned}$$

Record 40.0

Note: 40.00 is incorrect and will be marked as a wrong answer

ANSWER SHEET



decimal used in recording answer

2. The pH of 100 mL of a 0.100 mol/L $H_3PO_4(aq)$ solution, correct to three digits, is _____________.

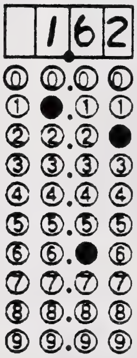
$$[H_3O^+(aq)] = \frac{24}{100}(0.100\ \text{mol/L})$$

$$= 0.024\ \text{mol/L}$$

$$\begin{aligned} \therefore \text{pH} &= -\log[0.024\ \text{mol/L}] \\ &= 1.619788758 \\ &= 1.62\ \text{(three-digit answer)} \end{aligned}$$

Record 1.62

ANSWER SHEET



decimal used in recording answer

3. The mass in grams of silver produced in an electrochemical cell when 0.110 mol of lead reacts, correct to three digits, is ________ g.

moles Ag $= \frac{2}{1}$ (moles Pb)

$= \frac{2}{1}(0.110 \text{ mol}) = 0.220 \text{ mol}$

$\therefore$ mass Ag $= (0.220 \text{ mol})(107.87 \text{ g/mol})$

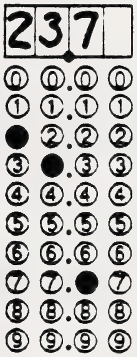
$= 23.7314 \text{ g}$

$= 23.7 \text{ g}$ (three-digit answer)

Record 23.7

Note: 23.73 is incorrect and will be marked as a wrong answer

ANSWER SHEET



Use the following information to answer question 4.

The equations represent endothermic reactions.

1. $H_2(\ell) \rightarrow H_2(g)$
2. $H_2(s) \rightarrow H_2(\ell)$
3. ${}^{4}_{2}He \rightarrow 2\,{}^{2}_{1}H$
4. $H_2(g) \rightarrow 2H(g)$

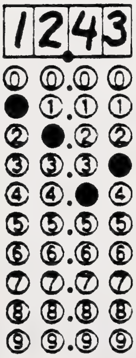
4. When the reactions are arranged in order of increasing heat of reaction the correct order will be ________.

Answer: 1,2,4,3

Record 12.43

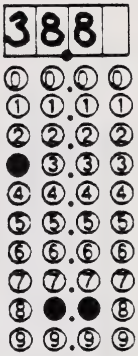
Note: correct-order question
$\therefore$ four individual digits
are recorded

ANSWER SHEET



5. When 150.0 kg of water at 87.0°C cool to 25.3°C, the number of megajoules of heat released, to three digits, is __________ MJ.

ANSWER SHEET



decimal used in recording answer

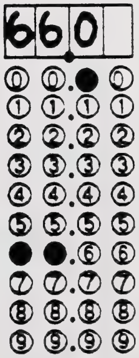
ΔH = (150.0 kg)(4.19 J/g°C)(61.7°C)
= 38778.45 kJ
= 38.77845 MJ
= 38.8 MJ (three digit answer)

Record 38.8

Note: 38.78 is incorrect and will be marked as a wrong answer

6. In an experiment, 150 mL of water at 83.0°C are added to a styrofoam cup containing 50.0 mL of water at 15.0°C. The final temperature of the mixture in degrees Celsius, to three digits, is ____________ °C.

ANSWER SHEET



decimal used in recording answer

loss = gain

(150 g)(4.19 J/g°C)(83.0°C − T)
= (50.0 g)(4.19 J/g°C)(T − 15.0°C)

12450 g°C − 150T g = 50.0T g − 750 g°C

13200 g°C = 200.0T g

$$T = \frac{13200\ \text{g°C}}{200.0\ \text{g}}$$

T = 66.0°C
(three digit answer)

Record 66.0

Note: 66.00 is incorrect and will be marked as a wrong answer

- Rounding for all calculation questions occurs only once, at the final step of the calculation.
- For an explanation of significant digits, manipulation of data, and rounding, see appendix A .

TARGET GROUP -- FOR WHOM IS THE COURSE INTENDED?

Physics combines scientific process skills with mathematical analysis skills. The primary language of physics is mathematics, and, even at the high school level, a student must show a reasonable level of mathematical competence. For this reason, entry into the Physics 10-20-30 course sequence requires clear passes in both Grade 9 Science and Grade 9 Mathematics. Thus 50% to 60% of the Grade 10 population could attempt Physics 10 with a reasonable chance of success. Assuming normal attrition during the course sequence, about 35% to 40% of the Grade 12 population could attempt the Physics 30 course of study.

The number of Physics 30 students is closer to 25% of the Grade 12 population; therefore, more students could enrol in Physics 30 and be successful. The course is equally appropriate for male and female students, but enrolment statistics show that far more males than females take Physics 30. There is no valid academic reason for this anomaly.

PERFORMANCE STANDARDS

Students who attain an *acceptable* level of performance in Physics 30 receive a final passing mark near 50%. They have gained new skills and knowledge in physics but can anticipate severe difficulties if they choose to enrol in post secondary physics courses.

Such students can state and solve problems that can be related quickly to an equation in the data booklet. Their laboratory skills are limited to following explicit directions and to using laboratory data to verify known physics information. These students are capable of calculating quantities such as refractive index, orbit radius, electric force, and photoelectric work function. They tend to use item-specific methods in their problem-solving and rarely use the major generalizations of physics, such as Newton's Laws or the conservation laws of charge, momentum, and energy. Minor changes in problem format cause these students major difficulties.

Students who attain an *exceptional* level of performance in Physics 30 receive a final mark of 80% or better. Such students have demonstrated their ability and interest in both mathematics and physics and feel confident about their scientific abilities. These students should encounter little difficulty in post secondary physics programs and should be encouraged to pursue careers that will utilize their talent in physics.

The exceptional students show far more flexibility and creativity than the average. They seek general methods and are not afraid to use conservation laws to solve an unusual problem. They transfer knowledge from one area of physics to another and can express their answers in clear and concise terms. In the laboratory, exceptional students can cope with data that are less than perfect or with instructions that are incomplete. They make inferences that are not part of the "known" parts of physics. In terms of concept development, they can make the distinction between vectors and scalars and between forces and fields. It is this group that can apply these distinctions to solve problems.

STRUCTURE OF THE EXAMINATION

Each Physics 30 diploma examination is designed to reflect the Physics 30 core concepts that are outlined in the *Program of Studies for Senior High Schools.*

The concepts on the Physics 30 diploma examinations are emphasized as follows:

Concept[1]	Emphasis in Per Cent of the Total Examination Mark
Nature and Behavior of Light	23
Electric and Magnetic Fields	27
Electromagnetic Radiation	15
Structure of Matter	20
Modern Physical Theories	15
	100%

The cognitive levels on the Physics 30 diploma examinations are emphasized as follows:

Cognitive Level[2]	Emphasis in Per Cent of the Total Examination Mark
Knowledge	25
Comprehension and Application	50
Higher Mental Activities	25
	100%

Each examination is built as closely as possible to the above specifications. However, some small adjustments are sometimes necessitated by the inclusion of five or six-mark written-response items. Also, the concept areas are distributed proportionately over the cognitive levels and vice versa. Questions that require knowledge and skill in the application of scientific processes are distributed throughout the examination but are not associated with specific topics or cognitive levels.

The design of the Physics 30 diploma examinations is as follows:

Question Format	Number of Questions	Number of Marks	% Emphasis
Multiple-Choice	49	49	70
Written-Response	4	21	30

---

[1] Concept descriptions have been shortened in this table.

[2] An explanation of cognitive levels is given in Appendix B.

EMPHASES FOR THE 1990 DIPLOMA EXAMINATIONS IN PHYSICS

- Some questions will require the synthesis of concepts from more than one unit.

- In all written-response questions involving calculations, an explicit formula statement is required as a first step, with the substituted values explicitly written down in a subsequent step.

- Numerical answers are only to be rounded once, at the end of the question. Intermediate answers are used as displayed on the calculator.

NEW DIRECTIONS FOR THE 1990 FIELD TESTS IN PHYSICS

- Machine-scorable open-ended questions will be field-tested in the 1989-90 school year. The purpose of the testing is to monitor the effects of significant figures, the use of prefixes, and the use of scientific notation. Each one-hour field test will contain 15 multiple-choice, five machine-scorable open-ended, and one written-response question. Each full-length field test will contain 37 multiple-choice, 12 machine-scorable open-ended, and four written-response questions.

- A document showing sample machine-scorable open-ended questions, together with explanations of the solutions, will be published early in the 1989-90 school year. This document will be distributed to all high schools.

- Written-response questions covering experimental design and practical technology will continue to be field-tested in the 1989-90 school year.

If field test results for these types of questions are satisfactory, these questions may be included in the 1991 series of diploma examinations.

EXAMINATION BUILDING PRINCIPLES

Most students learn physics by performing routine calculations first, then building a base of concepts in physics, and finally acquiring the capability of transferring the concepts and skills to new types of problems. The three multiple-choice questions that follow on page 28 require a knowledge of the magnetic force on a current-carrying wire; however, each question illustrates a different level of understanding.

EXAMPLE #1 -- ROUTINE CALCULATION

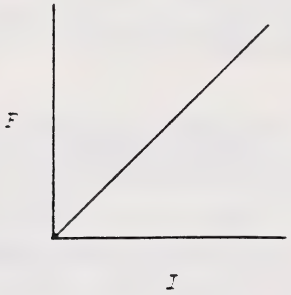
A 10.0 cm wire carries a 1.4 A current perpendicularly across a magnetic field of 1.7 T. The deflecting force on the wire is

*A. 0.24 N
B. 0.31 N
C. 3.1 N
D. 24 N

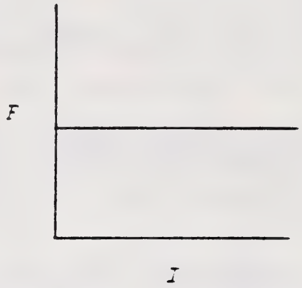
EXAMPLE #2 -- BUILDING A BASE OF CONCEPTS

Two parallel wires each carry current. One wire has a fixed current, while the second wire has a variable current. The force F as a function of the current I in the second wire is represented by

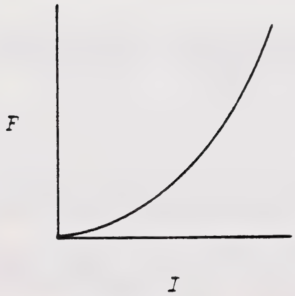
*A.



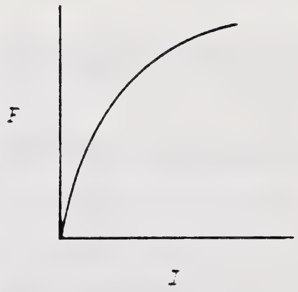
B.



C.



D.



EXAMPLE #3 -- TRANSFERRING CONCEPTS TO A NEW TYPE OF PROBLEM

A wire of linear density 0.025 kg/m and length 0.36 m is placed perpendicular to a magnetic field of strength 0.049 T. The current necessary to keep the wire suspended is

A. 0.51 A
B. 1.4 A
*C. 5.0 A
D. 14 A

Questions at each of the three levels of understanding will be present in the diploma examination. The written-response section will provide the majority of the questions involving higher level skills.

APPENDIX A: GUIDELINES FOR SIGNIFICANT DIGITS, MANIPULATION OF DATA, AND ROUNDING

The guidelines are based on those recommended by the Canadian Standards Association.

Significant Digits

1. Regardless of decimal position, for all non-logarithmic values any of the digits 1-9 is a significant digit, and 0 may be significant.

   e.g., 147   0.147   0.001 47 1.47×10^3 all have 3 significant digits

2. Leading zeros are not significant.

   e.g., 027 and 0.035 have 2 significant digits

3. Trailing zeros to the right of the decimal are significant.

   e.g., 0.127 00 and 20.000 have 5 significant digits

4. Zeros to the right of a whole number are considered to be ambiguous. *Therefore the Student Evaluation and Records Branch will consider all trailing zeros to be significant.*

   e.g., 200 will be considered as having 3 significant digits
   unless it is an exact count

   This ambiguous usage is not desirable, and the Branch will attempt to put most such numbers into scientific notation.

   e.g., 2×10^2 if 1 significant digit is intended
   2.0×10^2 if 2 significant digits are intended
   2.00×10^2 if 3 significant digits are intended

   Appropriate prefixes can be used as an alternative to scientific notation.

5. For logarithmic values, such as pH, any digit to the left of the decimal is *not* significant.

   e.g., 1.20 has 2 significant digits
   7 has 0 significant digits

Manipulation of Data

1. When adding or subtracting measured quantities, the calculated answer should be rounded to the same degree of precision as that of the least precise of the numbers used in the computation.

   e.g., 38.5 (least precise)
   0.123
   19.54
   58.163

   The answer should be rounded to 58.2.

2. When multiplying or dividing measured quantities, the calculated answer should be rounded to the same number of significant digits as are contained in the quantity that has the fewest significant digits.

   e.g., (36.3 cm)(451.91 cm) = 16 404.333 cm^2

   The answer should be rounded to 1.64×10^4 cm^2.

Rounding

1. When the first digit to be dropped is less than or equal to 4, the last digit retained should not be changed.

   e.g., 7.849 rounded to 2 digits is 7.8

2. When the first digit to be dropped is greater than or equal to 6, the last digit retained should be increased by one.

   e.g., 5.262 rounded to 2 digits is 5.3

3. When the first digit to be dropped is 5, the last digit retained should be increased by one.

   e.g., 2.148 501 rounded to 4 digits is 2.149
   2.135 22 rounded to 3 digits is 2.14
   3.7500 rounded to 2 digits is 3.8
   3.65 rounded to 2 digits is 3.7

APPENDIX B: EXPLANATION OF COGNITIVE LEVELS

1. Knowledge

Knowledge is defined as including those behaviors and test situations that emphasize the remembrance, either by recognition or recall, of ideas, material, or phenomena. This level comprises knowledge of terminology, specific facts (dates, events, persons, etc.), conventions, classifications and categories, methods of inquiry, principles and generalizations, and theories and structures.

2. Comprehension and Application

Comprehension refers to responses that demonstrate understanding of the literal message contained in a communication. This means that the student is able to translate, interpret, or extrapolate. Translation refers to the ability to put a communication into another language. Interpretation involves the reordering of ideas (inferences, generalizations, or summaries). Extrapolation is the ability to make estimates or predictions based on an understanding of trends or tendencies.

Application requires that the student applies an appropriate abstraction (theory, principle, idea, method) to a new situation.

3. Higher Mental Activities

Analysis, *synthesis*, and *evaluation* are included in the category of higher mental activities. Analysis comprises the ability to recognize unstated assumptions, to distinguish facts from hypotheses, to distinguish a conclusion from statements that support it, to recognize facts or assumptions that are essential to a main thesis or to the argument in support of that thesis, to distinguish cause-effect relationships from other sequential relationships, and to recognize a writer's viewpoint.

Synthesis is the production of a unique communication. It is the ability to propose ways of testing hypotheses, the ability to design an experiment, to formulate and modify hypotheses, and to make generalizations.

Evaluation is defined as making judgments about the value of ideas, solutions, and methods. It involves the use of criteria to appraise the extent to which details are accurate, effective, economical, or satisfying. Evaluation includes the ability to apply given criteria to judgments of work done, to indicate logical fallacies in arguments, and to compare major theories and generalizations.

APPENDIX C: USE OF CALCULATORS

GENERAL CLASSROOM USE

Scientific calculators (calculators with trigonometric and logarithmic keys) can and should be purchased and used by students in high school mathematics and physical science courses. Calculators with greater power and capacity to compute and store data bases and operate as electronic notebooks are also available, albeit at a price that is somewhat beyond what one would include as normal school supplies. As calculator technology changes, teachers will have to keep current with respect to the situation. At this time all Grade 12 students can be held responsible for acquiring and learning to use a scientific calculator.

The use of programmable calculators with numeric output should also be encouraged. The exercise of programming calculators is a valuable educational experience. Indeed, the electronic notebooks are also a useful teaching tool. Teachers should offer educational experiences based on the use of evolving technologies by providing challenging activities that lead to the integration of such technologies into the high school student's problem-solving strategies.

Similarly, Grade 9 students should be proficient in the use of calculators with memories. However, it is not expected that a provincial achievement test would require the use of such calculators. Thus, the use of calculators should be encouraged and a gradual increase of skill in the use of specialized functions should be expected throughout the school program so that mastery of such instruments is in place for high school.

While the use of calculators should be encouraged in the elementary grades, it is equally unlikely that there will be a requirement for such instruments on the grades 3 or 6 achievement tests.

Since the situation regarding the technology, availability, and use of calculators is still quite fluid, this policy will be reviewed on a yearly basis.

USE ON EXAMINATIONS

Policy

Alberta Education encourages the use of calculators in classrooms but, in order to ensure fairness and equity for students, the use of calculators that are equipped to show or print alphabetic output in natural language is not permitted on provincial examinations and tests. Students writing mathematics, chemistry, and physics diploma examinations are expected to have and use scientific calculators.

Guidelines

1. Approved calculators for use in examinations and tests administered on behalf of Alberta Education are characterized as those calculators which cannot graph mathematical functions, factor an algebraic function, accept alphabetic input nor produce alphabetic output, store natural language text, or attach to peripheral printers, disk drives, or other such devices.

2. Calculators with programmable features are approved for use in examinations provided that the memories have been cleared prior to the start of the examination or test.

Procedures

1. Presiding examiners will inspect all calculators brought into an examination room to ensure that this policy is not violated.

2. Assistance in clearing the memories of programmable calculators may be sought from other staff members.

3. Identification of approved calculators is the responsibility of the Chief Presiding Examiner and principal. Any exceptions to the guidelines must be approved by the Director, Student Evaluation and Records Branch, Alberta Education, prior to the day of the examination.